

9904-UDX-4K • 12G/6G UHD Up/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor



The Cobalt® **9904-UDX-4K 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor** is Cobalt's next generation of advanced scaler/frame synchronizers for the openGear® platform. The 9904-UDX-4K up-converts 12G/6G/3G/HD/SD to either UHD1 3840x2160 Square Division Multiplex (SDM) or Two-Sample Interleave (2SI) quad 3G-SDI based formats, or can output ST 2082 12G-SDI for single-wire 4K transport. With both 12G-SDI and quad 3G-SDI inputs, the 9904-UDX-4K can down-convert 12G and quad UHD. The 9904-UDX-4K provides an HDMI 2.0 output for economical 4K video monitoring. The 9904-UDX-4K offers numerous options, including SDR-to-HDR conversion and color correction.

The **9904-UDX-4K-IP** model offers the same functionality as the **9904-UDX-4K** SDI-based model, but additionally also provides dual 10GigE ports providing support for the emerging uncompressed video/audio/data over IP standards. The **9904-UDX-4K-DSP** model provides the same functionality as the 9904-UDX-4K SDI-based model, and also offers a DSP-based platform that supports multiple audio DSP options, including Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® E/D/D+ encode/decode, and Linear Acoustic® UPMAX™ automatic up-mixing. This high-density openGear® design allows for up to five 9904-UDX-4K cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via the free DashBoard user interface, or Cobalt's RESTful-based Reflex protocol.

Alternate Models:

9904-UDX-4K-DSP 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with DSP Advanced Audio Processing



FEATURES

High-density openGear comprehensive UHD UDX solution	Supports Cobalt's Reflex (JSON) Protocols
Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p, 2160p	Noise Reduction and Detail Enhancement provide image quality optimization
Full up/down conversion between HD/3G, ST 2082 12G-SDI single-wire, and SDQS/2SI quad 3G-SDI based formats, with ST 2082 12G-SDI single-wire and quad 3G UHD available at both input and output	Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol
Supports Square Division Multiplex (SDM) and Two-Sample Interleave (2SI) quad UHD	Hot-swappable
12G-SDI and quad 3G frame sync and user delay	Five-year warranty

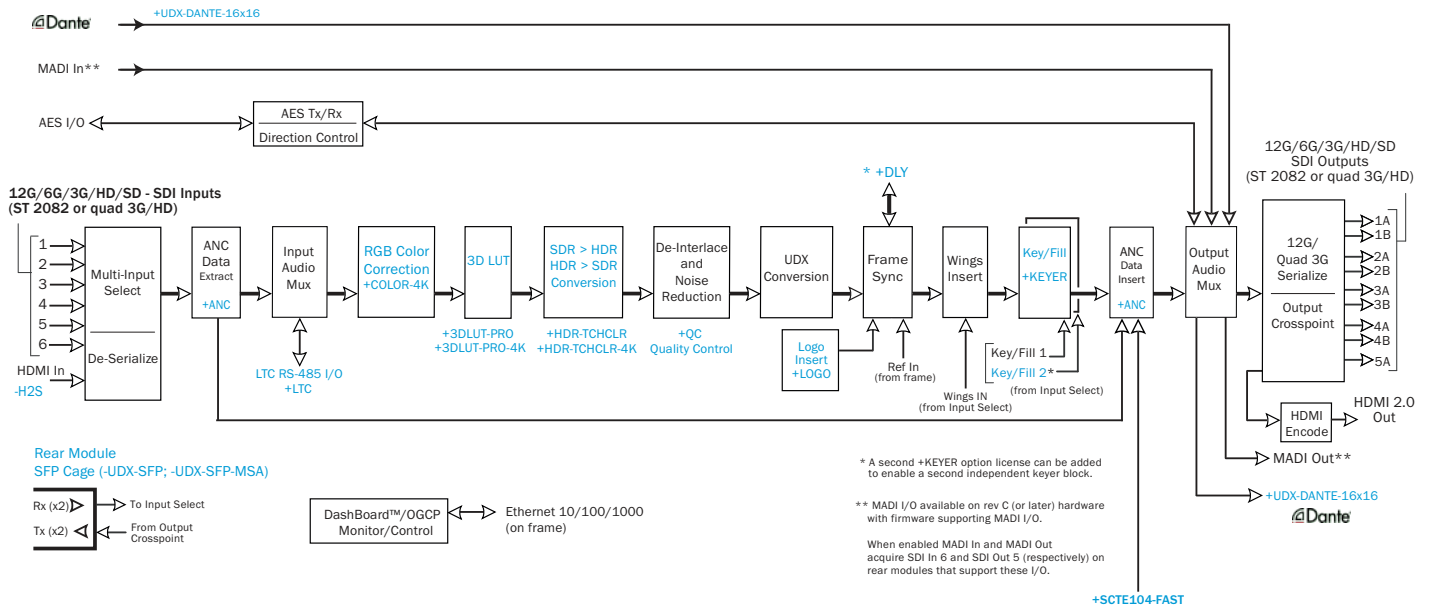
OPTIONS

SDR/HDR Conversion Options (+HDR-TCHCLR-4K, +HDR-TCHCLR) – Provides real-time intelligent HDR conversion powered by Technicolor®. Contains SDR-to-HDR, HDR-to-SDR, and HDR-to-HDR conversion with dynamic meta-data creation. Technicolor toolkits include SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.	Color Correction Options (+COLOR-4K, +COLOR) – Provides full RGB color corrector(offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.
3D LUT Options (+3DLUT-PRO-4K, +3DLUT-PRO) – 3D LUT (Look-Up Table) options provide 33 LUT mapping between 10-bit RGB and HDR color spaces.	Key/Fill Keyer Option (+KEYER-4K, +KEYER) – Provides keying using SDI inputs for key and fill signals. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input. (A second +KEYER option license can be added to enable a second independent keyer block.)
3D LUT Option (+3D-LUT-BBC) – Licensed product developed by the BBC, provides BBC 3D LUTS as optional SDR-to-HDR and HDR-to-SDR profiles.	-UDX-SFP Options – Adds daughter card supporting externally-accessible dual SFP cage. (See Ordering Information for SFP types available, descriptions, and further info.)
Audio LTC I/O Option (+LTC)	-H2S Option – Adds daughter card supporting externally-accessible HDMI input
Logo Insertion Option (+LOGO-4K, +LOGO) – Provides file-based insertion for branding local or destination branding/ID requirements.	+UDX-DANTE-16x16 16x16 Dante 16 channel input 16 channel output option (Cannot be used simultaneously with +HDR-TCHCLR and +LOGO).
+DUAL-OUTPUT-9904 Enables 4K and HD outputs on the 9904-UDX series. This license does not enable a second 4K path. It only supports +3DLUT-PRO and -H2S Options on both outputs.	+DLY option expands the standard 20 frame delay capability to 60 frames. (All video formats) *Not available if +DUAL-OUTPUT-9904 option is installed.
+SCTE104-FAST Frame Accurate SCTE104 Trigger. Software option - Available (per path)	
+QC Option Quality Check allows criteria such as black/ frozen frame events to propagate an event alert. This alert can be used by the card Presets function to invoke video routing changes, GPO, and other actions.	

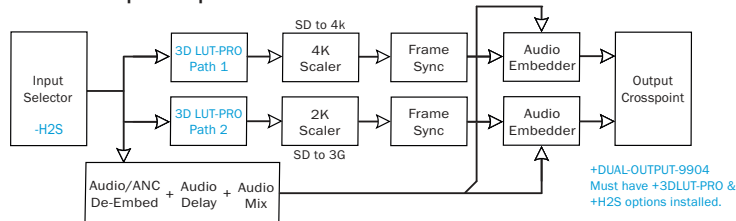
9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

9904-UDX-4K

12G/6G/3G/HD/SD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed/Audio Processor



* Dual Output Option Path Enabled

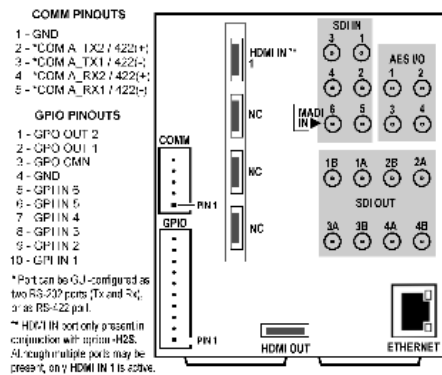


* All **OPTIONS** dependent on firmware variants

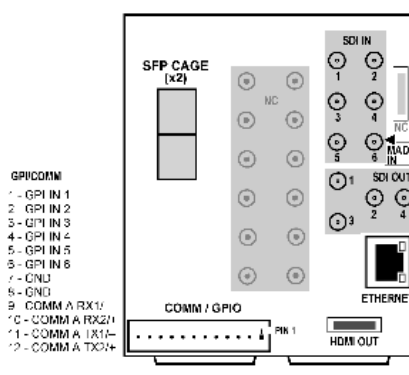
This color denotes option *

- * +DUAL-OUTPUT-9904 Enables 4K and HD outputs. This software license does not enable a second 4K path. It only supports +3DLUT-PRO and -H2S options on both outputs.
- * -H2S Option - Adds daughter card supporting externally-accessible HDMI input

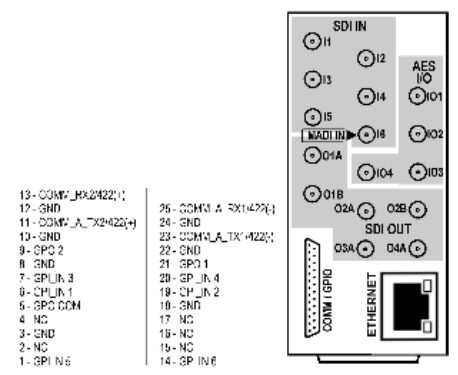
9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor



RM20-9904-A-HDBNC



RM20-9904-C-HDBNC



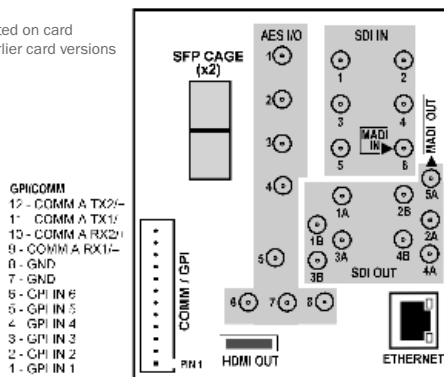
RM20-9904-D-HDBNC

Note: MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives (as shown in illustrations here).

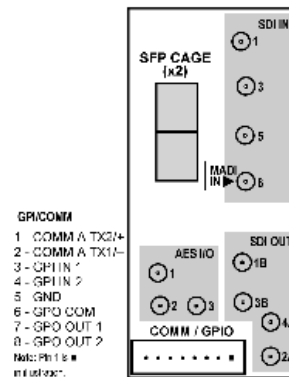
Note: Due to the alignment of the 9904 card and the -D rear module, the combination of the card and rear module will consume the adjacent odd frame slot in addition to the even slot occupied by the card.

Note: This rear module cannot be installed in frame slots 19/20 location. The 9904-UDX card, when installation is attempted, will clash/interfere with the frame network controller card.

Note: (8) AES ports supported on card hardware rev-E and later. Earlier card versions support (4) AES ports (max).

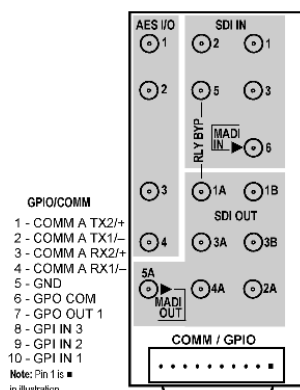


RM20-9904-F-HDBNC

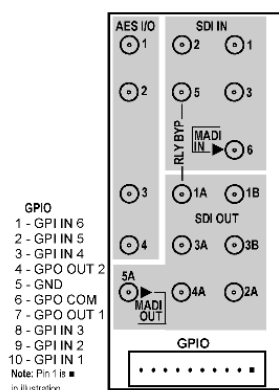


RM20-9904-G-HDBNC

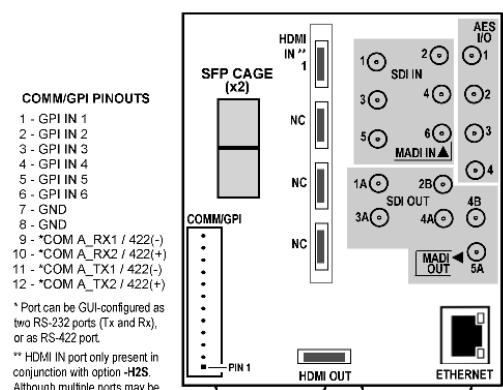
Note: Mates to card in odd slot.



RM20-9904-H-HDBNC



RM20-9904-J-HDBNC



RM20-9904-K-HDBNC

Note: 12G signals over relay bypass path stipulates the maximum cable length not to exceed 10m for a total of both the Input and Output cable lengths.

9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

SPECIFICATIONS

12G/6G/3G/HD/SD-SDI Input/Outputs

(6) 75 inputs (max)

(8) 75 outputs (max)

SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.

Return Loss:

> 15 dB up to 1.485 GHz

> 10 dB up to 3 GHz

> 7 dB up to 6 GHz

> 5 dB up to 12 GHz

Input Cable Length:

45m Belden 1694A cable at 11.88 Gbps / 120m Belden 1694A cable at 2.97 Gbps /

240m Belden 1694A cable at 1.485 Gbps / 400m Belden 1694A cable at 270 Mbps

Output Signal Level: 800 mV \pm 10%

DC Offset: 0 V \pm 50 mV

Rise and Fall Time @ 11.88 Gbps: < 45 ps

Alignment Jitter (12G/3G/HD/SD): < 0.3/0.3/0.2/0.2 UI

Frame Sync Audio/Video Delay

Max offset: 20 frames (Can be expanded to 60 frames with the **+DLY** option)

Latency (min): 1 frame

User Audio Delay Offset from Video

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

AES Audio Inputs/Outputs

(8) AES-3id 75 coaxial ports (max); port direction assignable as inputs or outputs in groups of 4 ports.

Note: Hardware rev -E and later has 8 AES ports; earlier versions have 4 port max.

MADI Audio Inputs/Outputs

(2) 75 coaxial ports (max)

Note: Not all rear modules support full MADI I/O. MADI I/O is a function of Rear Module used and is available only on card with on rev C (or later) hardware with firmware supporting MADI I/O. See Rear Module illustrations for specific information.

HDMI Output

HDMI 2.0 Output; type A standard connector

HDMI Input (Option -H2S only)

HDMI 2.0 Input; mini connector

GPIO

(6) GPI (max); (2) GPO (max)

Note: GPIO max capacity is a function of Rear Module used. See Rear Module illustrations for specific information.

Frame Reference Input

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Frame Loading (Max. recommended number of 9904 cards supported per Frame Model)

- OG3 Frame: (5) cards
- HPF-9000 Frame: (5) cards
- oGx Frame: (7) cards

Note: In all cases, it is recommended to leave a 1RU gap above the frame and set frame Network Controller Card to run the frame cooling fans at full (max.) speed.

9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

ORDERING INFORMATION - PAGE 1 OF 4

Rear Modules:

Note: MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives. Rear modules that support MADI are identified below as MADI Compatible.

- Rear modules with SFP access do not come standard with any SFP functionality. Appropriate SFP option must be provisioned for rear module SFP functionality.

SFP port-type availability depends upon SFP Type, rear IO module, and 9904-UDX host card rev as follows:

- **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs.

- **Option -UDX-SFP (non-MSA); Card Rev F and later with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.

- **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port is unused (NC).

- **Option -UDX-SFP (non-MSA); Card Rev F and later with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port support up to 2 Fiber outputs.

- **Option -UDX-SFP-MSA (no card restrictions):**

- Top SFP port supports 1 Fiber input and 1 Fiber output.
- Bottom SFP port supports 1 Fiber input and 1 Fiber output.

RM20-9904-A-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (8) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O (User Selectable), GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port. **MADI Compatible.** (All coaxial connectors HD-BNC.)

RM20-9904-C-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port. **MADI Compatible.** (All coaxial connectors HD-BNC.)

RM20-9904-D-HDBNC 20-Slot Frame Rear I/O Module (Standard-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, GPIO/COMM, 100/1000 BaseT Ethernet Port. **MADI Compatible.** (All coaxial connectors HD-BNC.)

RM20-9904-F-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port. **MADI Compatible.** (All coaxial connectors HD-BNC.)

RM20-9904-G-HDBNC 20-Slot Frame Rear I/O Module (Standard-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (3) AES I/O, (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), GPIO/COMM **MADI Compatible** (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

RM20-9904-H-HDBNC 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass fail over), (4) AES I/O, GPIO/COMM **MADI Compatible** (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

RM20-9904-J-HDBNC 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass fail over), (4) AES I/O, GPIO MADI Compatible (All coaxial connectors HD-BNC.) (**Note:** Mates to card in **odd** frame slot.)

9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

ORDERING INFORMATION - PAGE 2 OF 4

RM20-9904-K-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, COMM/GPI, HDMI 2.0 Output (type A standard connector), (1) HDMI 2.0 Input (mini connector) (when used in conjunction with option -H2S), (2) SFP cage receptacles (when used in conjunction with SFP option), 100/1000 BaseT Ethernet Port **MADI Compatible** (All coaxial connectors HD-BNC.)

Options:

Note: • Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.

- Options or ordering line items denoted as “-” are **hardware-based** options/items. These options are available as factory-installed *only on new products, or product returned to Cobalt for factory installation.*

+HDR-TCHCLR-4K 4K SDR/HDR Conversion Option

(This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

+HDR-TCHCLR SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

+3DLUT-PRO-4K 3D LUT 4K Option (compatible with up-mapping to HDR and processing for down-conversions to HD SDR color space)

+3DLUT-PRO 3D LUT Option (compatible with processing for down-conversions to HD SDR color space)

+3D-LUT-BBC BBC 3DLUT Option (Requires +3D-LUT-PRO or +3D-LUT-PRO-4K option to also be present to support this option)

+COLOR-4K 4K Color Correction Option

+COLOR Color Correction Option

+DUAL-OUTPUT-9904 Enables 4K and HD outputs on the 9904-UDX series

+SCTE104-FAST Frame Accurate SCTE104 Trigger. Software option available (per path)

+DLY Option expands the delay capability to 60 frames. (All video formats) **NOTE:** Not available if +DUAL-OUTPUT-9904 option is installed.

+QC Option Quality Check allows criteria such as black/ frozen frame events to propagate an event alert. This alert can be used by the card Presets function to invoke video routing changes, GPO, and other actions.

9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

ORDERING INFORMATION - PAGE 3 OF 4

+KEYER-4K 4K Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

+KEYER Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

+UDX-DANTE-16x16 16x16 Dante 16 channel input 16 channel output option. **NOTE:** Cannot be used simultaneously with +HDR-TCHCLR and +LOGO

+LOGO-4K 4K Logo Insertion Option

+LOGO Logo Insertion Option

+LTC Audio LTC I/O Option

-H2S Adds daughter card supporting externally-accessible HDMI input port; orderable as new option. **Note:** To support HDMI input option **-H2S**, this option is required in addition to card fitted with rear module (such as RM20-9904-B-HDBNC) that allows access to the daughter card - located HDMI input connector.

-UDX-SFP-MSA Adds daughter card supporting externally-accessible dual MSA SFP cage; orderable as new option. **Note:** To support SFP option(s) this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9904-UDX-4K card when also fitted with SFP option -UDX-SFP-MSA.

- **-UDX-SFP-MSA-2S** is required where 2-slot ("Standard-Width") rear module (such as RM20-9904-G-HDBNC) is to be fitted with SFP option.

- **-UDX-SFP-MSA-4S** is required where 4-slot ("Double-Width") rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC) is to be fitted with SFP option. Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-G-HDBNC, or RM20-9904-K-HDBNC and option -UDX-SFP-MSA-2S or -UDX-SFP-MSA-4S are purchased and available separately.

-SFP-E00E-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

-SFP-E0-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

-SFP-OE-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

-SFP-E00E-MSA Single-Channel Video Optical Transceiver (LC female connectors)

-SFP-E0-MSA Single-Channel Video Optical Transmitter (LC female connector)

-SFP-OE-MSA Single-Channel Video Optical Receiver (LC female connector)

-SFP-IP-SWD-MSA Software-Defined MSA SFP 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD-MSA (Up to 3 software licenses can be added to the -SFP-IP-SWD-MSA, but only 1 license can be active at a time):

+ADD-SFP-IP-TO-SDI-2022-6 SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

+ADD-SFP-IP-TO-SDI-2110 SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

+ADD-SFP-SDI-TO-IP-2022-6 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

+ADD-SFP-SDI-TO-IP-2110 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

9904-UDX-4K • 12G/6G UHD UP/Down/Cross Converter / Frame Sync / Embed /De-Embed Audio Processor

ORDERING INFORMATION - PAGE 4 OF 4

-UDX-SFP Adds daughter card supporting externally-accessible dual SFP cage; orderable as new option. Note: To support SFP option(s), this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9904-UDX-4K card when also fitted with SFP option -UDX-SFP.

- **-UDX-SFP-MSA-4S** daughter card is used with 4-slot ("Double-Width") rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC). UDX-SFP-MSA is only available for use in conjunction with 4-slot rear modules and daughter card (-UDX-SFP-MSA-4S).

Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-K-HDBNC and option -UDX-SFP-MSA-4S are available separately.

-SFP-E00E-12G 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

-SFP-E0-12G 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

-SFP-0E-12G 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

-SFP-2E0-12G 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter (LC female connector)

-SFP-20E-12G 12G/6G/3G/HD/SD-SDI UHD Dual Receiver (LC female connector)

-SFP-E00E Single-Channel Video Optical Transceiver (LC female connectors)

-SFP-E0 Single-Channel Video Optical Transmitter (LC female connector)

-SFP-0E Single-Channel Video Optical Receiver (LC female connector)

-SFP-2E0 Dual-Channel Video Optical Transmitter (LC female connector)

-SFP-20E Dual-Channel Video Optical Receiver (LC female connector)

-SFP-IP-SWD Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

+ADD-SFP-2SDI-TO-IP-2022-6 SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6

+ADD-SFP-2SDI-TO-IP-2110 SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110

+ADD-SFP-IP-TO-2SDI-2022-6 SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI

+ADD-SFP-IP-TO-2SDI-2110 SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI

+ADD-SFP-IP-TO-SDI-2022-6 SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

+ADD-SFP-IP-TO-SDI-2110 SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

+ADD-SFP-SDI-TO-IP-2022-6 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

+ADD-SFP-SDI-TO-IP-2110 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110